

Remarks

Claims 1-82 were pending prior to the above amendments. Claims 16 and 47 are canceled. Claims 1-3, 30 and 32 are amended to more particularly point out and distinctly claim Applicants' invention.

The Specification is amended to correct grammatical and typographical errors.

The Examiner objected to the drawings as failing to show a snubber recited in Claim 16. As Claim 47 also recite a snubber, Claims 16 and 47 are accordingly canceled.

The Examiner allowed Claims 17-29 and 48-82.

The Examiner rejected Claims 1-2, 4-11 and 14-15 under 35 U.S.C. § 102(e) as being anticipated by the admitted prior art of Figure 3 ("APA Figure 3").

Applicants respectfully traverse the Examiner's rejection of these claims as being anticipated. As amended, Claim 1 now recites:

1. (Currently amended)An isolated boost converter for driving an output load, comprising:

an input voltage source;

a boost inductor connected in series with the input voltage source;

a storage capacitor which receives energy from the input voltage source, the storage capacitor having a first terminal and a second terminal;

a transformer including a primary winding and secondary winding, the primary winding having a first terminal and a second terminal;

first and second switches that, when both closed, couple the first terminal and the second terminal of the storage capacitor to the first terminal and the second

terminal of the primary winding of the transformer,
respectively, in a series connection;

a clamp diode coupling the first terminal of the
storage capacitor to the first terminal of the primary
winding of the transformer;

an output filter coupled to the output load;

a rectifier coupling the secondary winding of the
transformer to the output filter; and

a switch control circuit to simultaneously open
and close the first and second switches.

(emphasis added)

The clamp diode of Claim 1 is neither disclosed nor suggested by APA Figure 3. As discussed in Applicants' Specification, at page 8, lines 15-24, the clamp diode provides a current path for the current in the primary winding at its negative peak. APA Figure 3 also does not disclose or suggest this benefit of the clamp diode. Thus, Applicants respectfully submit that Claim 1 and its dependent Claims 2, 4-11 and 14-15 are each allowable over APA Figure 3. Reconsideration and allowance of Claims 2, 4-11 and 14-15 are therefore requested.

The Examiner rejected Claim 3 as being anticipated over APA Figure 3, in view of U.S. Patent 6,507,176 ("Wittenbreder"). The Examiner cites Wittenbreder as teaching "using diodes to clamp parasitic ringing (cols. 37-39)."

Applicants respectfully traverse the Examiner's rejection of Claim 3 over APA Figure 3, in view of Wittenbreder. Claim 3 depends from Claim 1. As discussed above, APA Figure 3 fails to disclose or suggest Claim 1's "clamp diode coupling the first terminal of the storage capacitor to the first terminal of the primary winding of the transformer." While Wittenbreder teaches using a diode, Wittenbreder fails to teach the clamp diode coupling between the storage capacitor and the transformer in the manner recited in Claim 1. Without the specific coupling, the benefit of conduction path at the negative peak of the current in the primary

winding is not achieved. Thus, Applicants respectfully submit that Claim 3 is allowable over the combined teachings of APA Figure 3 and Wittenbreder. Reconsideration and allowance of Claim 3 are therefore requested.

The Examiner rejected Claims 12-13 under 35 U.S.C. § 103(a) as being unpatentable over APA Figure 3, in view of U.S. Patent 6,191,957 ("Peterson"). The Examiner cites Peterson as teaching "sensing and referencing of the output and controlling of the primary circuit switches to produce the output voltage (col. 1, lines 10-40)."

Applicants respectfully traverse the Examiner's rejection of Claims 12-13 over APA Figure 3 in view of Peterson. First, contrary to the Examiner's assertion, at col. 1, lines 10-40, Peterson does not disclose or suggest "a sensing circuit and a reference circuit," as recited in each of Claims 12-13. At that portion of Peterson's disclosure, Peterson merely discusses the operation of a conventional boost converter, in response to a drive signal of duty cycle D. Thus, Claims 12-13 are each allowable over the combined teachings of APA Figure 3 and Peterson, as construed by the Examiner. Further, Claims 12-13 each depend from Claim 1. As discussed above, APA Figure 3 neither discloses nor suggests the configuration of the clamp diode recited in Applicants' Claim 1. As such a clamp diode is also neither disclosed nor suggested by Peterson, Claims 12-13 are each further distinguished over the combined teachings of APA Figure 3 and Peterson. Reconsideration and allowance of Claims 12-13 are therefore requested.

The Examiner rejected Claims 30-31, 33 and 37-42 and 45-46 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,538,906 ("Ke") in view of APA Figure 3.

The Examiner states:

Claims 30, 33 37-42, 45 and 46; Ke et al disclose an

input voltage source (Vin), a capacitor (Cr), transformer (TR), first, second and third switches (S1, S2, S3) for coupling the capacitor to the primary; output filter (L1, C2) coupled to a load; rectifier (D1, D2); switch control for periodically opening and closing the switches(col. 2, lines 25-30).

However, Ke et al does not disclose the input voltage source is connected to a boost inductor.

Ke et al do not teach that the energy storage circuit can be used in any type of DC-DC converter, such as boost converter with boost switch voltage as charging source.

Furthermore, APA figure 3 teaches an isolated boost converter using a boost inductor in series with input voltage for providing a boosted output voltage.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Ke et al to include a boost inductor in series with the voltage source as taught by APA figure 3 in order to provide a boost converter having a boosted output voltage at the output.

Claim 31; Ke et al and APA figure 3 both disclose plural diodes for providing current paths and decoupling the primary and resetting the transformer (Ke et al: col. 2 lines 25-30)

Applicants respectfully traverse the Examiner's rejection of Claims 30-31, 33 and 37-42 and 45-46 over Ke, in view of APA Figure 3. As amended Claim 30 recites:

30. (Currently amended) An isolated boost converter for driving an output load, comprising:

an input voltage source connected in series with a boost inductor;

a capacitor, having a first terminal and a second terminal, that receives energy from the input voltage source;

a transformer having a primary winding and secondary winding, the primary winding having a first terminal and a second terminal;

first, second, and third switches, when all closed, coupling the capacitor to the primary winding of the transformer in a series connection, wherein the first switch connects the first terminal of the capacitor to the

first terminal of the primary winding, the second switch and third switch connect the second terminal of capacitor to the second terminal of the primary winding, and the second switch connect the boost inductor to the second terminal of the capacitor;

an output filter coupled to the output load;

a rectifier coupling the secondary winding of the transformer to the output filter;

a switch control circuit to periodically open and close the first, second, and third switches.

(emphasis added)

The above-underscored configuration of the switches, the capacitor, the primary winding and the boost inductor is disclosed or suggested by neither Ke nor APA Figure 3. As disclosed in Applicants' Specification, at page 13, lines 20-29 and at page 14, lines 7-16, such an arrangement allows the third switch to be switched under zero-voltage switching ("ZVS") condition, and extends the operation of the circuit to when the boost inductor can operate under discontinuous current mode ("DCM"). As neither Ke nor APA Figure 3 discloses such a configuration or suggests its benefits, Applicants respectfully submit that Claim 30 and dependent Claims 31, 33 and 37-42 and 45-46 are each allowable over the teachings of Ke and APA Figure 3, individually or under any combination. Reconsideration and allowance of these claims are therefore requested.

The Examiner rejected Claim 32 under 35 U.S.C. § 103(a) as being unpatentable over Ke, APA Figure 3, as construed above, in view of Wittenbreder. The Examiner cites Wittenbreder as teaching "using diodes to clamp parasitic ringing (cols. 37-39)."

Applicants respectfully traverse the Examiner's rejection of Claim 32 over Ke and APA Figure 3, in view of Wittenbreder. Claim 32 depends from Claim 30. As discussed above, Ke and APA Figure 3 fail to disclose or suggest Claim 30's specific configuration of

switches, capacitor and boost inductor. Such a configuration is also neither disclosed nor suggested in Wittenbreder. Thus, Claim 32 is allowable over Ke, APA Figure 3 and Wittenbreder for the reasons stated above. Further, Claim 32 recites “clamp diode coupling the first terminal of the storage capacitor to the first terminal of the primary winding of the transformer.” While Wittenbreder teaches using a diode, Wittenbreder fails to teach the clamp diode coupling between the storage capacitor and the transformer in the manner recited in Claim 1. Without the specific coupling, the benefit of conduction path at the negative peak of the current in the primary winding is not achieved. Thus, Applicants respectfully submit that Claim 32 is allowable over the combined teachings of Ke, APA Figure 3 and Wittenbreder. Reconsideration and allowance of Claim 32 are therefore requested.

The Examiner rejected Claims 35 and 36 under 35 U.S.C. § 103(a) as being unpatentable, respectively, over Ke, APA Figure 3 in view of U.S. Patent 6,466,458 (“Zhang”) and over Ke, APA Figure 3 in view of U.S. Patent 6,538,906 (“Gurwicz”).

Applicants respectfully traverse the Examiner’s rejection of Claims 35 and 36 above. As discussed above, Claim 30 recites a configuration of the switches, the capacitor, the primary winding and the boost inductor, which is disclosed or suggested by neither Ke nor APA Figure 3. Neither such a configuration, nor its attendant benefits are disclosed or suggested by Zhang or Gurwisc. Zhang shows at Figure 4 capacitor Cb, which is coupled only to one terminal of the primary winding. Gurwicz lacks a capacitor coupled by switches to the primary winding. Thus, as Claims 35 and 36 each depend from 30, Claims 35-36 are each allowable over the teachings of Ke, APA Figure 3, Zhang and Gurwisc, individually or in any combination. Reconsideration and allowance of Claims 35-36 are therefore requested.

The Examiner rejected Claims 43-44 under 35 U.S.C. § 103(a) as being unpatentable

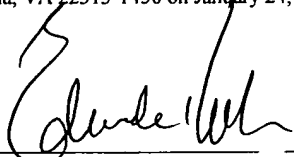
over Ke, APA Figure 3, in view of Peterson. The Examiner cites Peterson as teaching “sensing and referencing of the output and controlling of the primary circuit switches to produce the output voltage (col. 1, lines 10-40).”

Applicants respectfully traverse the Examiner’s rejection of Claims 43-44 over Ke, APA Figure 3 in view of Peterson. First, contrary to the Examiner’s assertion, at col. 1, lines 10-40, Peterson does not disclose or suggest “a sensing circuit and a reference circuit,” as recited in each of Claims 43-44. As noted above, in that portion of Peterson’s disclosure, Peterson merely discusses the operation of a conventional boost converter, in response to a drive signal of duty cycle D. Thus, Claims 43-44 are each allowable over the combination of Ke, APA Figure 3 and Peterson, as construed by the Examiner. Further, as discussed above, Claim 30 recites a configuration of the switches, the capacitor, the primary winding and the boost inductor, which is disclosed or suggested by neither Ke nor APA Figure 3. Neither are such a configuration and its attendant benefits disclosed or suggested by Peterson. Thus, as Claims 43-44 each depend from 30, Claims 43-44 each further distinguish over the teachings of Ke, APA Figure 3 and Peterson. Reconsideration and allowance of Claims 43-44 are therefore requested.

The Examiner’s rejections of Claims 15 and 47 are deemed moot in view that Claims 16 and 47 are canceled.

Therefore, for the reasons set forth above, all pending claims (i.e., Claims 1-15, 17-46 and 48-82) are allowable over the art of record. If the Examiner has any question regarding the above, the Examiner is respectfully requested to telephone the undersigned Attorney for Applicant at 408-392-9250.

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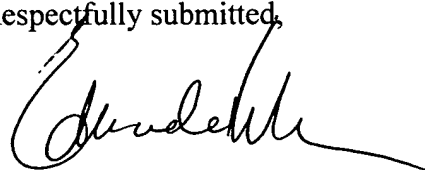


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1/24/2005

Date of Signature

Respectfully submitted,


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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 10/608,314 Filing Date: June 26, 2003
Confirmation No.: 8013
First Named Inventor: Yungtaek Jang
Assignee: Delta Electronics, Inc.
Examiner: Laxton, Gary Art Unit: 2838
Attorney Docket No.: M-15070 US

San Jose, California
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Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUBMISSION OF FORMAL DRAWINGS

Dear Sir:

Applicants submit thirty-nine (39) sheets of formal drawings, consisting of Figures 1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 6e, 6f, 6g, 6h, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 7i, 7j, 7k, 7l, 8a, 8b, 8c, 8d, 8e, 8f, 8g, 8h, 8i, 8j, 8k, 8l, 9, 10, 11a, 11b, 11c, 11d, 11e, 11f, 11g, 11h, 11i, 11j, 11k, 11l, 12a, 12b, 12c, 12d, 12e, 12f, 12g, 12h, 12i, 12j, 12k, 12l, 12m, 13, 14, 15, 16, 17, and 18 in the above-named application. If there are any questions regarding these drawings, please call the undersigned at (408) 392-9250.

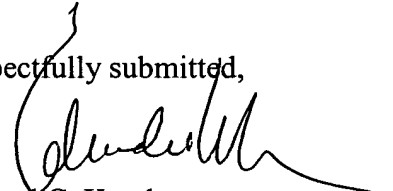
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